4-WIRE SINGLE FREQUENCY (4WSF) CHANNEL UNIT, 628275

GENERAL DESCRIPTION

CONTENTS PAGE

1. GENERAL 1
2. DESCRIPTION 1
3. FUNCTIONAL OPERATION (FIG. 2) 2
TRANSMIT VF CIRCUIT 2
RECEIVE VF CIRCUIT 2
TRANSMIT SIGNALING 2
RECEIVE SIGNALING 2
CARRIER GROUP ALARM 2
FREQUENCY MULTIPLEXER ALARM 4
BUSY MODE 4
4. OPTIONS 4
5. RESTRICTIONS 4
6. TEST AND MAINTENANCE FEATURES 4
7. TECHNICAL SUMMARY 4
8. REPLACEABLE PARTS 6
9. REFERENCES 6

1. GENERAL

1.01 This Section provides a general description of the ITT D448 4-wire single frequency (4WSF) channel unit, 628275 (Fig. 1), to the functional block diagram level.

1.02 Whenever this Section is reissued, the reasons for reissue will be listed in this paragraph.

1.03 The unit provides a voice frequency (VF) and single frequency (SF) inband signaling interface between the central office (C.O.) equipment and the D448 multiplex terminal common equipment. In the transmit direction, the unit converts VF and SF information into pulse code modulation (PCM) for application to the common equipment. In the receive direction, the unit decodes received PCM into VF and inband signaling information. (The unit contains a 2600-Hz tone generator.) During system outages, the unit provides two disconnect/make-busy routines for the trunk. The unit also monitors an FDM alarm circuit. The unit provides the office end of a 600-ohm, 4-wire, two-way message circuit.

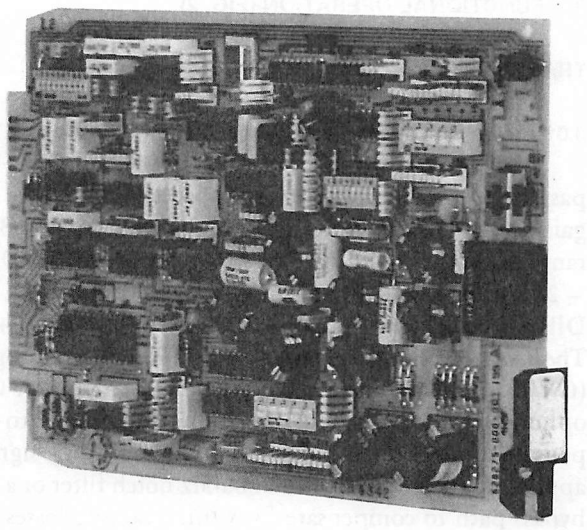


Fig. 1—4WSF Channel Unit, 628275

2. DESCRIPTION

2.01 The unit mounts in the D448 multiplex shelf (channel unit mounting section) in connectors J1A through J24A (for Digroup A) or connectors J1B through J24B (for Digroup B). Installation procedures for the unit is provided in Section ITTR-18-441.

2.02 The unit is available in Group -0 only.

2.03 The unit consists of an epoxy-glass printed circuit board (PCB) and associated circuit components. The lower front edge of the PCB is fitted with a handle to facilitate insertion and removal of the unit from the shelf. An identification strip on the handle face indicates the unit mnemonic (4WSF), last three digits of the model number, last three digits of the part number, and issue letter. The part number and issue letter are also located on the component side of the PCB.

2.04 The F LED (DS1), the BSY switch (S5), and the splitting card jack (J1) are located on the front edge of the PCB.

2.05 Printed circuit wiring is etched on both sides of the PCB. The unit inputs and outputs are terminated in gold-plated contacts on the rear edge of the PCB. These contacts mate with a 60-pin contact edge connector on the rear of the multiplex shelf.

3. FUNCTIONAL OPERATION (FIG. 2)

TRANSMIT VF CIRCUIT

3.01 The incoming VF is transformer-coupled, via part of the transmit (TX) level DIP switch, to the low-pass/high-pass filter where it is amplified and filtered. The gain applied to the input signal can be varied over a 31-dB range to compensate for VF input levels from +9.0 to −22.0 dBm (in 1-dB steps) by the selection of TX level DIP switch options [+1], [+2], [+4], [+8], and [+16]. The resulting signal is passed to the TX office wiring loss (OWL) compensation circuit. The TX prescription OWL options provide 0 to 1.5 dB of gain in 0.1-dB steps to compensate for wiring/cabling loss. The resulting signal is applied to the encoder via a 2600-Hz notch filter or a filter bypass path to compensate for wiring/cabling losses. The resultant range for input levels is +9.0 to −23.5 dBm.

3.02 When a 2600-Hz (SF) tone is present, it is detected by the tone detector and a 2600-Hz notch filter is inserted in the transmit VF path by the TX control circuit. Also, if the receive (RX) is idle, the RX VF path is cut by the RX control circuit.

3.03 The encoder converts the VF signal and signaling information (Para. 3.06 and 3.07) to an 8-bit PCM word. When the TX AND gate is activated by the transmit logic unit (TLU) on the TCS4-X and TCS6-X leads, the 8-bit word is applied to the TLU via the TCD bus. The data is clocked out of the unit under control of the 1.536-MHz clock from the TLU.

RECEIVE VF CIRCUIT

3.04 An 8-bit PCM word from the receive logic unit (RLU) is applied to the decoder on the RCD bus. The decoder will only accept the data when the RX AND gate is activated by the RLU on the RCS4-X and RCS6-X leads. The decoder converts the PCM word into VF signal and signaling information (Para. 3.08 and 3.09).

3.05 The VF signal is applied to the low-pass filter via the VF cut path and tone mixer circuits and passed through to the RX OWL compensation circuit. The RX prescription OWL options provide 0 to 1.5 dB of gain in 0.1-dB steps to the signal out of the low-pass filter to compensate for office wiring/cabling losses. The output of this circuit is further amplified. This amplification can be varied over a 31-dB range (in 1-dB increments) by the selection of RX VF level DIP switch options [−1], [−2], [−4], [−8], and [−16]. This provides output levels of +10.5 to −22.0 dBm in 0.1-dB increments with both the OWL and VF level options. The amplified VF is transformer-coupled to the C.O. equipment.

TRANSMIT SIGNALING

3.06 An idle condition is represented by a 2600-Hz (SF) tone being present on the tip and ring. A busy condition is represented by the absence of an SF tone. When DIP switch option [NO] is selected, the 2600-Hz notch filter and guard banding circuitry are deactivated. The tone detector detects the presence or absence of SF tone and signals the TX signaling (SIG) interface circuit as to these conditions via the pulse corrector circuit, DIP switch option [TI] selected, or directly with DIP switch option [TO] selected.

3.07 During an idle condition, the TX SIG interface circuit applies a digital zero to the encoder. During a busy condition, the TX SIG interface applies a digital one to the encoder. The encoder will not process the information supplied to it until it is signaled on the TA/B lead by the TLU that the signaling frame is upcoming.

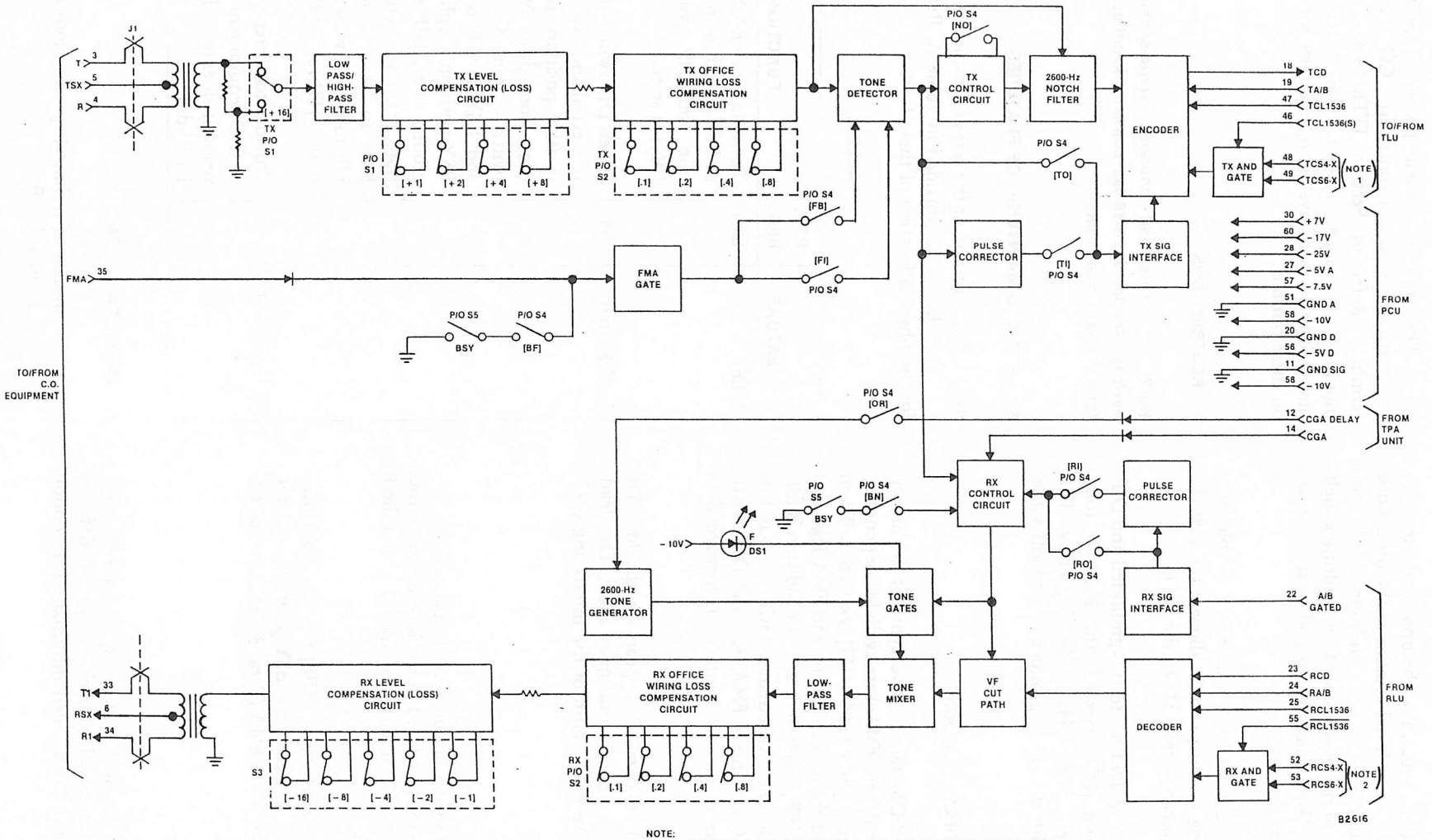
RECEIVE SIGNALING

3.08 The decoder converts receive signaling information from the 8-bit PCM word when it is signaled by the RLU on the RA/B lead that the signaling frame is being processed by the terminal. The decoded signaling information is applied to the RX SIG interface circuit.

3.09 When the far end is busy, the RX SIG interface circuit applies the RX signal to the RX control circuit and the tone gate, with DIP switch option [RO] selected, or via the pulse corrector with DIP switch option [RI] selected. The RX control circuit forces the VF cut path circuit to close the VF receive path. The tone gate removes the 2600-Hz tone generator from the input to the low-pass filter and turns on the F LED.

CARRIER GROUP ALARM

3.10 During a system outage, two carrier group alarm (CGA) signals (CGA immediate ground and CGA DELAY) and DIP switch option [OR] control the CGA functions of the unit. When a CGA occurs, the CGA lead



NOTE:
1. MAY BE TCS4-A, B, C, OR D AND TCS6-A, B, C, D, E, OR F DEPENDING ON POSITION.
2. MAY BE RCS4-A, B, C, OR D AND RCS6-A, B, C, D, E, OR F DEPENDING ON POSITION.

Fig. 2—4WSF Channel Unit, 628275, Functional Block Diagram

provides an immediate ground to the unit, and the CGA DELAY lead provides a delayed ground to the unit. Both grounds remain until the CGA condition is cleared. Strapping options on the backplane of the multiplex shelf control when the CGA immediate ground occurs after an alarm signal is received.

3.11 When the CGA lead is grounded, it disables the RX signaling circuitry which allows the 2600-Hz tone generator to forward 2600 Hz to the C.O.

3.12 When the CGA DELAY lead is grounded and DIP switch option [OR] selected, the 2600-Hz tone generator is disabled (no 2600 Hz), indicating a busy. This function, along with the CGA, produces a wink-off signal to the C.O.

FREQUENCY MULTIPLEXER ALARM

3.13 During an FDM failure, two types of frequency multiplexer alarms (FMAs) are available depending on which DIP switch option [FB] or [FI] is selected. When a ground is applied from the C.O. on the FMA lead and DIP switch option [FB] is selected, a busy condition is forwarded to the far end. Alternately, when ground is applied from the C.O. on the FMA lead and DIP switch option [FI] is selected, an idle condition is forwarded to the far end.

3.14 The FMA lead (pin 35) appears on the M/ATB lead connector of the multiplex shelf. This lead may be wired to the FDM alarm of the interfacing C.O. equipment.

BUSY MODE

3.15 When DIP switch option [BN] is selected and the BSY switch (S5) is placed in the BSY position, the near end is busied (no SF tone sent to the C.O. and the F LED is turned on).

3.16 When DIP switch option [BF] is selected and the BSY switch is placed in the BSY position, the unit will function as though an FMA (Para. 3.13) has occurred.

4. OPTIONS

4.01 The 4WSF channel unit is equipped with DIP switch options for selecting circuit options. Refer to Section ITTR-18-441 for detailed information on option selection.

4.02 The multiplex shelf provides options on the backplane which control the CGA timing of the terminal. Refer to Section ITTR-18-405 (for shelves mounted in 23-inch bays) or ITTR-18-406 (for shelves mounted in 19-inch bays) for option selection information on these options.

5. RESTRICTIONS

WARNING: This unit contains static-sensitive (CMOS) devices. Section ITTR-18-599 contains handling instructions for CMOS-equipped units.

6. TEST AND MAINTENANCE FEATURES

6.01 A description of the test and maintenance features of the unit is provided in Table A. Refer to Fig. 1 for the physical location of these features.

TABLE A

FEATURE	REF. DES.	FUNCTION
F LED	DS1	Turns on when RX SIG is busy or BSY switch is in BSY position and DIP switch option [BN] is selected.
BSY Switch	S5	When DIP switch option [BN] is selected and switch is placed in BSY position, removes SF tone from drop. When DIP switch option [BF] is selected and BSY switch is placed in BSY position, duplicates FMA ground (i.e., DIP switch option [FB] selected forwards busy to far end or forwards idle to far end with DIP switch option [FI] selected).
Splitting Card Jack	J1	Provides test/break jack access to C.O. equipment and channel unit sides of T, R, T1, and R1 leads.

7. TECHNICAL SUMMARY

7.01 A summary of technical specifications for the unit is given in Table B.

TABLE B

ITEM	SPECIFICATION
DC POWER	
Voltage	**Current Drain (nominal)**
GND (at +5V)	22.0 mA
−10V (at −5V)	6.0 mA (RX idle), 0 mA (RX busy)
+7V (at +12V)	15.0 mA
−17V (at −12V)	15.0 mA (RX idle), 21.0 mA (RX busy)
−42 to 56V Battery	0 mA
VF PERFORMANCE	
Impedance	600 ohms balanced
Levels	
Transmit	+9.0 to −23.5 dBm, adjustable in 0.1-dB steps
Receive	+10.5 to −22.0 dBm, adjustable in 0.1-dB steps
Loss Stability (End-to-End)	±0.5 dB over life in 95% of the circuits
Tracking (End-to-End)	
−37 to +3 dBm0 Input	0.5 dB maximum deviation
−50 to −37 dBm0 Input	1.0 dB maximum deviation
Idle Channel Noise (End-to-End)	23 dBrnc0 maximum
Signal-to-Distortion	
0 to −30 dBm0 Input	33 dB minimum overall; 35 dB minimum receive or transmit
−40 dBm0 Input	27 dB minimum overall; 29 dB minimum receive or transmit
−45 dBm0 Input	22 dB minimum overall; 25 dB minimum receive or transmit
Single Frequency Distortion (at 0 dBm0)	
Input Swept from 0 to 12 kHz	−28 dBm0 maximum at any other frequency
Input between 1004 and 1020 Hz	−40 dBm0 or less at any other frequency of 0 to 4 kHz with a distortion contribution objective from either transmit or receive of typically 6 dB better

TABLE B (CONT)

ITEM	SPECIFICATION
Return Loss	
1000 Hz	28 dB minimum
300 to 3000 Hz	23 dB minimum
Frequency Response (referenced 1020 Hz End-to-End)	
With Notch Filter Not Activated	
200 Hz	0, −3.0 dB
300 to 3000 Hz	±0.3 dB
3200 Hz	+0.3, −1.5 dB
3400 Hz	0, −3.0 dB
With Notch Filter Activated	
2600 Hz	< −45.0 dB
304 to 2004 Hz	−0.4 to +0.4 dB
3004 Hz	−0.95 to −0.25 dB
3204 Hz	−1.5 to +0.15 dB
Longitudinal Balance (AT&T or IEEE Method)	
At Each Port With Simplex Lead Open	
200 Hz	86 dB minimum
1000 Hz	80 dB minimum
3000 Hz	78 dB minimum
With 300 Ohms Between Simplex Lead and Ground	
200 Hz	66 dB minimum
1000 Hz	60 dB minimum
3000 Hz	58 dB minimum
SIMPLEX OPERATION (AT EACH VF PORT)	
Simplex Lead Current (Sum of Tip and Ring Current)	60 mA maximum
Current Unbalance (Difference Between Tip and Ring Current)	1.5 mA maximum
SIGNALING	
Transmit Frequency	2600 ±15 Hz

TABLE B (CONT)

ITEM	SPECIFICATION
Level	
Idle Tone	−9 to −38 dBm0
Dial Pulsing	+3 to −26 dBm0
Channel Noise	<45 dBrnc0
Signaling Distortion (Ave. Over Continous Dial Pulsing)	
With TX Pulse Corrector Out	
7.5 pps, 12 to 88% Break	±1.5%
10 pps, 15 to 85% Break	±2.0%
12.5 pps, 19 to 81% Break	±2.5%
20 pps, 35 to 65% Break	±6.0%
With TX Pulse Corrector In	
10 pps, 60% Break	60 ±4%
7.5 pps, 27 to 88% Break	39 to 80%
10 pps, 35 to 85% Break	52 to 72%
12.5 pps, 43 to 81% Break	60 to 65%
Receive	
Tone Generator Frequency	2600 ±1 Hz
Level	
Idle Tone	−20 ±1 dBm0
Dial Pulsing	−8 ±1 dBm0
Off Leak	< −80 dBm0
Signal Distortion (Ave. Over Continuous Dial Pulsing) Tone Control Distortion With RX Pulse Corrector Out	
7.5 pps, 10 to 90% Break	±1.5%
10 pps, 13 to 87% Break	±2.0%
12.5 pps, 16 to 84% Break	±2.5%
20 pps, 35 to 65% Break	±6%
Pulse Corrector (Input)	
7.5 pps, 10 to 90% Break	39 to 80% (output) break
10 pps, 13 to 87% Break	52 to 72% (output) break
12.5 pps, 16 to 84% Break	60 to 65% (output) break
VF Path Cut	
RX SIG Cut	125 ±50 ms
TX SIG Cut	625 ±150 ms
TX SIG and RX SIG Idle	Cut continuously
OPERATING ENVIRONMENT	
Temperature	0 to +55°C
Humidity	To 95% at 40°C (no condensation)
Altitude	To 14,000 ft (4,300 m)
DIMENSIONS	
Width	0.8 in. (1.9 cm)
Height	5.9 in. (15.0 cm)
Depth	9.7 in. (24.6 cm)
WEIGHT	0.5 lb (0.2 kg)

8. REPLACEABLE PARTS

8.01 This unit has no field-replaceable parts.

9. REFERENCES

9.01 The engineering drawings noted in Table C were used in the preparation of this Section.

TABLE C

TYPE	DRAWING NO.
Assembly	628275-000
Schematic	628275-002

9.02 Related information on the unit may be found in the ITTR Sections referenced in Table D.

TABLE D

TITLE	SECTION NO.
Connectorized Multiplex Shelf (MS/WC7, MS/WC5, MS/C7 and MS/C6), 628001, 628005, 628011 and 628015 (For 23-Inch Bays) — Option Selection, Installation and Pretest	ITTR-18-405
Connectorized Multiplex Shelf (MS19/WC7, MS19/WC5, MS19/C7 and MS19/C6), 628003, 628008, 628013 and 628018 (For 19-Inch Bays) — Option Selection, Installation and Pretest	ITTR-18-406
Special Service Channel Units — Option Selection and Installation	ITTR-18-441